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REPORT NO. 88-R-02
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QUALIFICATION TESTING
CNU-399/425 FIBERGLASS MAVERICK MISSILE CONTAINER

HQ AFLC/DSTZ
AIR FORCE PACKAGING EVALUATION ACTIVITY
Wright-Patterson AFB OH 45433-5999

9 AUGUST 1988

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ABSTRACT

Aeronautical Systems Division, ASD/SDML, requested assistance from the Air Force Packaging Evaluation Activity to conduct qualification testing on the CNU-399E/425E fiberglass Maverick missile containers.

The CNU-399E/425E container was designed by Plastics Research Corporation, 13538 Excelsior Dr., Santa Fe Springs CA 90670 and was fabricated under contract number F33657-87-C-2162 by AC Inc., 1085 Jordan Rd., PO Box 17069, Huntsville AL 35810-7069. The containers are environmentally sealed with a humidity indicator, desiccant port, and a pressure relief valve. The containers are designed to protect one AGM-65A/B/C/D/E/F all-up-round Maverick missile during worldwide shipment, storage, and handling. The containers will also be used for one missile without the guidance unit and for one missile without the guidance unit and the hydraulic actuation system. The CNU-425/E is the Air Force version of the container. The CNU-399/E is the Navy version and differs from the CNU-425/E only in some external Navy-specific handling features.

The test plan used for these containers was derived from ASD/SDML Specification Number CON 319 dated 30 May 86. The tests were conducted in accordance with Federal Test Method Standard No. 101, Military Standard 648, U.N. Standard (Ref. ICAD 4.3) and ASD/SDML Specification Number CON 319.

Results of the tests conducted on the containers were unacceptable. The containers did provide adequate mechanical protection, protecting the missile from severe shock, but environmental protection was marginal. The containers were unable to pass the leak test after the high temperature rough handling tests.

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INTRODUCTION

BACKGROUND: Aeronautical Systems Division (ASD/SDML), Wright-Patterson AFB OH 45433-5999 requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to conduct qualification testing on fiberglass Maverick missile containers. The CNU-399/425 container was designed by Plastics Research Corporation, 13538 Excelsior Dr., Santa Fe Springs CA 90670 and was fabricated under contract number F33657-87-C-2162 by AC Inc., 1085 Jordan Rd., PO Box 17069, Huntsville AL 35810-7069.

PURPOSE: The purpose of this project was to determine whether the CNU-399/425 containers would protect the contents, the AGM-65A/B/C/D/E/F all-up-round (AUR) Maverick missile, as set forth in ASD/SDML Specification Number CON 319. The container will also be used for shipment, storage, and handling of the missile less the guidance unit (GU) and the missile less both the GU and the hydraulic actuation system (HAS).

TEST SPECIMEN

Two containers (serial numbers 0168 and 0176) were sent from AC Inc. for testing. The containers were the CNU-425, which is the Air Force version of the container. The CNU-399 container, the Navy version of the container, differs only in some external Navy-specific handling features and was not tested. The corners of the containers were numbered from the aft end (see figure 1).

DESIGN: The CNU-399/425 is a controlled-breathing container with a pressure relief valve, a humidity indicator, and a desiccant port. The container is designed to limit the transmission of shocks to the missile at 40G or less when subjected to the conditions in ASD/SDML Specification CON 319. Twenty T-bolts attach the container cover to the container base. The missile is attached to the cradle by forward and aft clamps.

CONSTRUCTION: The container consists of a fiberglass reinforced plastic cover, base, cradle, forward clamp and aft clamp, which have been gel coated. Rubber pads between the missile and the cradle prevent scratching or scarring of the missile body. Two pound density polyethylene foam provides cushioning between the cradle and the container base. A neoprene (or equivalent) gasket provides a seal between the container base and the container cover. It should be noted that the containers had additional glass matting added to the cover (see figure 2) and the base (see figure 3) than is described in the technical data package. Also, extra sealant compound was added to each hardware attachment point (see figures 4 and 5) to potentially eliminate unfavorable test results as described in attachments 1 and 2.

TEST OUTLINE AND TEST EQUIPMENT

TEST PLAN: Tests were conducted in accordance with Attachment 6 of contract number F33657-87-C-2162 (see table I). Table II tabulates the results of the instrumented testing. An additional test of Barcol Hardness was conducted at the request of ASD/SDML (see table III). Test methods and procedures used were as outlined in Federal Test Method Standard 101 (FTMS No. 101), Military Standard 648 (MIL-STD-648), U.N. Standard (Ref. 1CAD 4.3) and ASD/SDML Specification CON 319 dated 30 May 86. Any modifications to the standard procedures are noted in the test plan or the results.

TEST CONTAINERS: Tests 1-11 in this report were performed on the CNU-425 container (see figure 6).

TEST LOADS: All tests were conducted using the standard heavy test load weighing 670 pounds. A container base loaded with 4321 pounds (five times the gross weight of a container with a heavy standard load) was also used where noted to simulate stacked containers.

TEST SITES: Testing was conducted at AFPEA, HQ AFLC/DS72, Building 70, Area C, Wright-Patterson AFB OH 45433-5999. The equipment required for each test is noted in the test plan.

TEST PROCEDURES AND RESULTS

INCOMING INSPECTION (CNU-425)

Test No. 1: The container, as received, was visually inspected. The exterior and interior surfaces, hardware, cushioning, markings, and container seal were inspected. The container was also checked for weight compliance.

Results: Container 0168 weighed 386 pounds and container 0176 weighed 394 pounds. The total weight is over the 350 pound limit in the CON 319 specification, but was waived by ASD/SDML. All other container features were found to be acceptable.

LEAK TEST

Test No. 2: The pneumatic pressure test and the vacuum retention test were conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was 0.050 psig loss during a 60 minute period.

Results: At the end of the 60 minute test period, container 0168 had a pressure test leak rate of 0.003 psig and a vacuum test leak rate of 0.027 psig. After 60 minutes, container 0176 had a pressure test leak rate of 0.00 psig, however leaks were

found in flange at T-bolts 13 and 17. The vacuum test on container 0176 had a leak rate of 0.027 psig. The results of this test are acceptable.

ROUGH HANDLING TESTS (AMBIENT TEMPERATURE), STACKED PENDULUM IMPACT

Test No. 3: Containers 0168 and 0176 were subjected to the rough handling, stacked pendulum impact test in accordance with 5.2.7.1 of MIL-STD-648. The impact velocity was 7 feet/sec from a drop height of 9 inches. Container 0176 was the test container and was instrumented.

Results: Visual inspection revealed damage to the forward stacking interface on the bottom of container 0168 (see figure 7). Container 0176 was damaged on the forward stacking interface on the cover (see figure 8). A maximum of 13.1Gs was obtained during the test.

LEAK TEST

Test No. 4: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2 on container 0176. The test was performed at 1.00 psig. The failure criteria for the test was 0.013 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.000 psig. It should be noted that the room temperature increased .5°C. However, leaks were evident at bolts in forkwell area (below T-bolts 5, 15 & 18) and T-bolts 3, 4 & 13. The results of this test are acceptable.

ROUGH HANDLING TESTS (+140°F)

Test No. 5A: The high temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.

Container 0176:

Results: Visual inspection revealed no apparent damage to the exterior of the container. A maximum of 10.2Gs was obtained during the test.

Container 0168:

Results: Visual inspection revealed no apparent damage to the exterior of the container. A maximum of 9.7Gs was obtained during the test.

Test No. 5B: The high temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The height of the drop was 20 inches.

Container 0176:

Results: Visual inspection revealed no apparent damage to the exterior of the container. A maximum of 10.0Gs was obtained during the test.

Container 0168:

Results: Visual inspection revealed no apparent damage to the exterior of the container. A maximum of 11.4Gs was obtained during the test.

Test No. 5C: The high temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The impact velocity was 10 ft/sec from a drop height of 18.60 inches.

Container 0176:

Results: Visual inspection revealed no apparent damage to the exterior of the container. A maximum of 10.0Gs was obtained during the test.

Container 0168: (see figure 9)

Results: Visual inspection revealed no apparent damage to the exterior of the container. A maximum of 10.3Gs was obtained during the test.

Complete visual inspection on container 0176, after the high temperature rough handling tests revealed chips broke away from the forkwell pockets (see figure 10), gel coat came off of flange at corners 1-4, 1-2 and on base at corner 1-4. crazing was evident on container base below T-bolt 14 and on cover between T-bolts 13 & 14. The following leak test failed, therefore the high temperature rough handling test results were unacceptable.

Complete visual inspection on container 0168, after the high temperature rough handling tests revealed chips broke away from flange at corner 1-2 (see figure 11), crazing was evident on the base at corner 2-3 and cracks were evident in the forkwell pockets on side 2 in two places. The following leak test failed, therefore the high temperature rough handling test results were unacceptable.

LEAK TEST

Test No. 6: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.00 psig. The failure criteria for the test was 0.013 psig loss during a 15 minute period.

Container 0176:

Results: At the end of the 15 minute test period the pressure loss was 0.036 psig. Leaks were evident at bolts in forkwell area below T-bolts 5 & 15 and the security seal on side 2. The container was opened and side 4 forward strap had broken (not in stitching, see figure 12); forward clamp cracked on side 4 area; abrasion on aft end of lower cradle (see figure 13); forward rubber cushioning on lower cradle was deformed; forward portion of lower cradle unglued from cushion (see figure 14); and delamination on inside of cover on forward stacking interface (see figure 15). The results of this test are unacceptable.

Container 0168:

Results: At the end of the 15 minute test period the pressure loss was 0.058 psig. Leaks were evident on aft end side 4 tiedown ring, at flange between T-bolts 16 & 17 and at T-bolts 7 & 16. The container was opened and the forward clamp cracked further (see figure 16); abrasion evident on aft end of lower cradle; the forward rubber cushioning on lower cradle was deformed (see figure 17); forward portion of lower cradle unglued from the cushion; upper back fin of missile on side 2 hit the desiccant basket; and the aft clamp was no longer straight (appears missile moved forward, see figure 18). The results of this test are unacceptable.

FREE FALL DROP TEST (18")

Test No. 7: The free fall drop test was conducted in accordance with ASD/SDML Specification CON 319, 4.2.2.1.10 on container 0168. The drop height was 18 inches.

Results: Visual inspection revealed no damage to the container. A maximum of 19.0Gs was obtained during the test. The results of this test are acceptable.

LEAK TEST

Test No. 8: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2 on container 0168. The test was performed at 1.00 psig. The failure criteria for the test was 0.013 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.000 psig. The results of this test are acceptable.

HOISTING STRENGTH TEST (1 RING AND 4 RING)

Test No. 9: The single ring hoisting test was conducted in accordance with MIL-STD-648, paragraph 5.8.5 on container 0168. The loaded container was lifted by one lift ring and suspended for one hour. The 4 ring hoisting strength test was conducted in accordance with MIL-STD-648, paragraph 5.8.3 on container 0176. The container was loaded with 5,320 pounds (using the simulated stacked load) and hoisted by all four lift points simultaneously and left hanging for one hour (see figure 19).

Results: Visual inspection on container 0168 revealed that the ring located on side 2, aft end elongated approximately 0.5 inches (see figure 20). Visual inspection revealed no damage to container 0176. The results of this test are acceptable.

LEAK TEST

Test No. 10: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2 on containers 0168 and 0176. The test was performed at 1.00 psig. The failure criteria for the test was 0.013 psig loss during a 15 minute period.

Results: At the end of the 15 minute test period the pressure loss was 0.000 psig for containers 0168 and 0176. The results of this test are acceptable.

FREE FALL DROP TEST (4')

Test No. 11: The free fall drop was conducted on container 0168 in accordance with U.N. Standard (Ref. ICAD 4.3), with a drop height of 4 feet. The failure criteria shall be when the container spills its contents.

Results: Visual inspection revealed a crack in the forkwell pocket on side 4; crazing in the aft end of the base; and the record receptacle cover attachments points sheared off and could no longer be secured to the container (see figure 21). The results of this test are acceptable.

CONCLUSIONS

1. A strap broke during high temperature rough handling. This strap was not twisted when the container was received and it has been determined that the force from the pendulum impact overstressed the strap and broke it.
2. Leaks occurred in the container forkwell area, at various T-bolts, at a tiedown ring, and in the flange area between T-bolts. It has been determined that these leaks occurred due to the rough handling tests, which loosened the T-bolts.

3. Cracks were present or developed in the forward clamp during rough handling tests. It was determined that the missile moved forward, damaging the inside of the forward clamp and the rubber padding on the lower cradle and abrading the aft end of the lower cradle.

4. Delamination in the fiberglass, especially in the base and around the desiccant basket occurred throughout testing.

5. The containers did provide adequate mechanical (physical, i.e. low G-levels recorded) protection for the missile, but environmental protection is very marginal (containers unable to pass the leak test after the high temperature rough handling).

RECOMMENDATIONS

1. The following improvements may prevent and/or eliminate problems in the containers:

a. Ensure enough sealant compound is applied to the attachment bolts just prior to installation. Also, add more sealing compound around all attachment points (i.e. bolts at forkwell area, tiedown rings, bolts that secure straps to the container base, handles, etc.)

b. After hardware is installed, apply an additional glass "patch" over bolts at forkwell area to eliminate potential leakage areas.

c. Examine sealing surface for roughness. If rough areas are found, sand until sealing surface is smooth. Wipe away any dust or dirt.

d. Clean sealing surface thoroughly to eliminate all dust and/or dirt. Possibly use an alcohol base solvent.

e. Use a digital readout torque wrench to close the container at the manufacturer (to approximately 100 in-lbs). This would ensure that equal forces are applied over the entire length of the flange, and would eliminate over compression and/or under compression of the gasket.

f. Add to the data package, nuts bonded/secured on the inside of container to install the humidity indicator and the pressure relief valve. The fiberglass threads quickly stripped out during testing.

g. Have the containers pressure tested after the missile has been loaded at the missile manufacturer to insure environmental protection.

Enter for 110 x 32 x 29.7	Gross 1000	Net 60.5	071000
Model MAVERICK MISSILE, AGM65		Customer USAF, WPAFB	

Container Name:

SHIPPING AND STORAGE CONTAINER, GUIDED MISSILE CNU-399/E

QUALIFICATION TEST GUIDE

Attachment 6 Page 1 of 3

F33657-87-C-2162

Test No.	Ref Std/Spec and Test Method or Procedure No.	Test Title and Parameters	Configuration	Instrumentation
2.	<u>LEAK TEST</u> Fed-Std-101 Method 5009.1 (4.2.2.1.16)	Leak Test: Pneumatic Pressure, 1.0 PSI Vacuum Pressure, 1.0 PSI Leakage must be less than 0.050 PSI per hour.	Test at ambient condition from compressed air supply/vacuum pump	Water Manometer
3.	<u>ROUGH HANDLING TESTS (AMBIENT TEMPERATURE)</u>			
d.	MIL-STD-648 Para. 5.2.7.1	Stacked Pendulum-Impact Test, impact velocity 7 ft/sec, drop height 9.0 inches. Banding of containers shall be through the banding reliefs provided on the container	Stacked 2 high and banded, one impact on each end, and on each side, total of 4 impacts w/heaviest AUR	2 containers
4.	<u>LEAK TEST</u> Fed-Std-101 Method 5009.1 (4.2.2.1.16)	Leak Test: Pneumatic Pressure, 1.00 PSI Leakage must be less than 0.013 PSI in 15 minutes.	Test at ambient condition from compressed air supply.	Water Manometer
13.	<u>ROUGH HANDLING TESTS (HIGH TEMPERATURE +140°F)</u>			
a.	Fed-Std-101 Method 5005.1 (4.2.2.1.7)	High Temperature Cornerwise-drop (Rotational) Test, heat in chamber +140°F for not less than 24 hours, drop height 20 inches.	One drop on 2 diag. corners w/heaviest AUR total of two drops	

Comments:

TABLE I.

Prepared By:

Approved By:

Container Name:

SHIPPING AND STORAGE CONTAINER, GUIDED MISSILE CNU-200/1

Attachment 6 Page 2 of 3
F33657-87-C-2162

Test No.	Ref Std/Spec and Test Method or Procedure No.	Test Title and Parameters	Configuration	Instrumentation
b.	Fed-Std-101 Method 5008.1 (4.2.2.1.7)	High Temperature Edgewise-drop (Rotational) Test, heat in chamber + 140° for not less than 24 hours, drop height 20 inches.	One drop to two bottom edges, total of 2 drops. w/heaviest AUR	Thermocouple
c.	Fed-Std-101 Method 5012 (4.2.2.1.7)	High Temperature Pendulum-Impact Test, heat in chamber +165°F for period not less than 6 hrs temperature of shock mitigation system at time of test shall be +140° (+ 5°F). Impact velocity 10 ft/sec, drop from 18.60 inches.	One impact on each side and each end total of 4 impacts w/heaviest AUR	
4.	<u>LEAK TEST</u> Fed-Std-101 Method 5009.1 (4.2.2.1.16)	Leak Test: Pneumatic Pressure, 1.00 PSI Leakage must be less than 0.013 PSI in 15 minutes.	Test at ambient condition from compressed air supply.	Water Manometer
19.	<u>FREE FALL DROP TEST</u> (4.2.2.1.10)	Free Fall Flat Drop Test, drop height 18 inches.	One drop on bottom w/heaviest AUR.	
4.	<u>LEAK TEST</u> Fed-Std-101 Method 5009.1 (4.2.2.1.16)	Leak Test: Pneumatic Pressure, 1.00 PSI Leakage must be less than 0.013 PSI in 15 minutes.	Test at ambient condition from compressed air supply.	Water Manometer

Comments:

TABLE I (Cont'd)

Prepared By:

Approved By:

Container Size Interior: 134	(L x W x D inch) Exterior: 110 x 32 x 29.7	WEIGHT (LBS) Gross: 11000 Net:	CUBE (CUFT) 60.5	QUANTITY	DATE 27 Feb 86
Item Name: MAVERICK MISSILE, AGM 65			Customer:		

Container Name:
SHIPPING AND STORAGE CONTAINER, GUIDED MISSILE CNU-399/E

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P33657-87-C-2162

Test No.	Ref Std/Spec and Test Method or Procedure No.	Test Title and Parameters	Configuration	Instrumentation
23.	<u>HOISTING STRENGTH TEST</u> Mil-Std-648 Para 4.17.3.1 & 5.8.1 (4.2.2.1.12)	Hoisting Test, container loaded to 3 times gross weight. Hoist with the HLU 216/E weapon cradle hoist beam and leave hanging for 1 hour. Hoist loaded container at one lift point and leave hanging for one hour. Hoist one container loaded to 5 times gross weight by all lift points simultaneously and leave hanging for one hour. Legs of the sling should be greater than 30° from the horizontal. Rings should be at least 2 1/2 inches diameter.	Test: 1. w/ heaviest AUR	
4	<u>LEAK TEST</u> Fed-Std-101 Method 5009.1 (4.2.2.1.16)	Leak Test: Pneumatic Pressure, 1.00 PSI. Leakage must be less than 0.013 PSI in 15 minutes.	Test at ambient condition from compressed air supply.	Water Manometer
18.	<u>FREE FALL FLAT DROP</u> U.N. Standard (Ref. ICAO 4.3)	Free fall drop test. Drop height 4 feet. Note: Success criteria is that the missile stay inside the container.	One flat drop onto a concrete surface w/heaviest AUR.	N/A

Comments:

TABLE I. (Cont'd)

Prepared By:

Approved By:

TABLE II. G-LEVEL TEST RESULTS

ROUGH HANDLING, STACKED PENDULUM IMPACT, CONTAINER 0176

Impact	Orientation	CG Accelerometer (Gs)
7 ft/sec pendulum-impact	Side 1	8.3
7 ft/sec pendulum-impact	Side 2	13.1
7 ft/sec pendulum-impact	Side 3	10.0
7 ft/sec pendulum-impact	Side 4	6.4

HIGH TEMPERATURE ROUGH HANDLING TESTS (+140^o F)

Impact	Position	Filter*	CG Accelerometer (Gs)
CONTAINER 0168			
20" drop	Corner 1-2	34 Hz	9.7
20" drop	Corner 3-4	34 Hz	7.6
20" drop	Edge 3	33 Hz	7.9
20" drop	Edge 4	32 Hz	11.4
Pendulum	Side 1	32 Hz	7.7
Pendulum	Side 2	25 Hz	9.5
Pendulum	Side 3	39 Hz	9.4
Pendulum	Side 4	24 Hz	10.3
CONTAINER 0176			
20" drop	Corner 1-4	32 Hz	10.2
20" drop	Corner 3-4	32 Hz	8.7
20" drop	Edge 1	45 Hz	10.0
20" drop	Edge 2	45 Hz	4.8
Pendulum	Side 1	32 Hz	6.3
Pendulum	Side 2	30 Hz	8.8
Pendulum	Side 3	54 Hz	8.6
Pendulum	Side 4	25 Hz	10.0

* Filtered at $5/(2T)$, T = duration (sec).

FREE FALL DROP, CONTAINER 0168

Drop height	Acceleration at CG (Gs)
18 inches	19.0

TABLE III. BARCOL HARDNESS TEST RESULTS

LOCATION	BARCOL HARDNESS RECORDING*	
	ACTUAL	AVERAGE
CONTAINER 0168		
Cover, exterior, side 1	42, 38, 38	39
Cover, exterior, side 2	42, 43, 49	45
Cover, exterior, side 3	44, 42, 39	42
Cover, exterior, side 4	33, 44, 42	39
Cover, exterior, top center	42, 45, 41	43
Cover, exterior, top stacking interface	39, 30, 40	37
Cover, interior	38, 60, 40, 47	46
Base, exterior, side 2	44, 33, 45	41
Base, exterior, side 4	44, 46, 49	46
Base, interior	52, 43, 53, 55	51
Base, interior, flange	44, 28, 38, 41	38
Forward clamp	51, 47, 47, 50	49
CONTAINER 0176		
Cover, exterior, side 1	49, 49, 49	49
Cover, exterior, side 2	52, 52, 45	50
Cover, exterior, side 3	51, 47, 52	50
Cover, exterior, side 4	52, 52, 50	51
Cover, interior	42, 32, 30, 35, 47, 40	38
Base, exterior, side 2	43, 42, 44	43
Base, exterior, side 4	44, 43, 38	42
Base, interior	52, 43, 50, 55	50
Base, interior, flange	34, 19, 17, 12, 18	20
Forward clamp	28, 57, 53, 56, 58	50

* The container component shall exhibit an average Barcol hardness of 40 minimum. No reading less than 30 is acceptable.

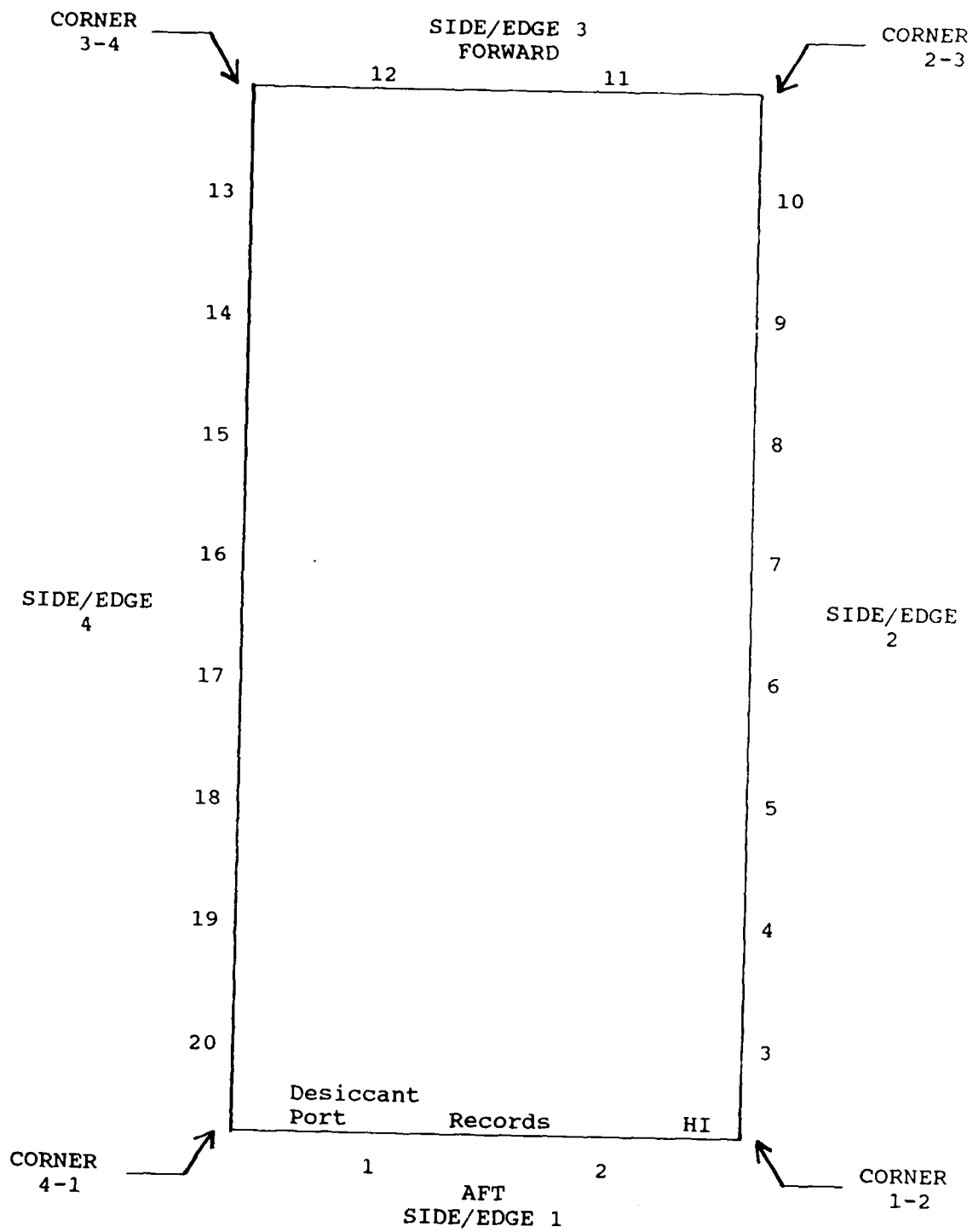
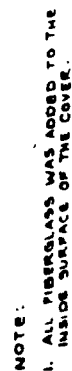


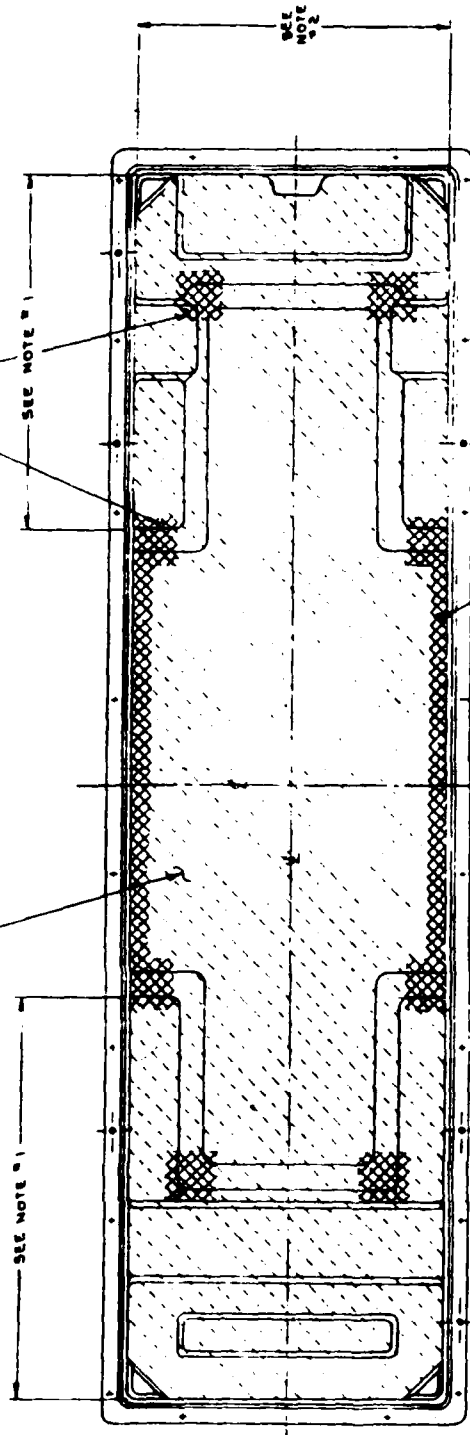
FIGURE 1. CONTAINER CONFIGURATION



DATE	BY	REVISION

FOUR ADDITIONAL LAYERS OF BI-PLY FIBERGLASS (CONSISTING OF: ONE LAYER OF 24 OZ. WOVEN AND ONE LAYER OF 1 1/2 OZ. FIBERGLASS MAT EACH) WAS ADDED IN THIS AREA (THIS MAKES A TOTAL OF FIVE LAYERS OF BI-PLY FIBERGLASS ADDED IN THIS AREA). TYPICAL, 8 PLACES.

ONE LAYER OF BI-PLY FIBERGLASS (CONSISTING OF: ONE LAYER OF 24 OZ. WOVEN AND ONE LAYER OF 1 1/2 OZ. FIBERGLASS MAT) ADDED TO THE ENTIRE BOTTOM SURFACE OF THE CONTAINER BASE.



ONE ADDITIONAL LAYER OF BI-PLY FIBERGLASS (CONSISTING OF: ONE LAYER OF 24 OZ. WOVEN AND ONE LAYER OF 1 1/2 OZ. FIBERGLASS MAT) WAS ADDED IN THIS AREA WHICH EXTENDED AROUND RADIUS IN THE BOTTOM OF THE BASE AND APPROX. 2" UP THE SIDE WALL. (THIS MAKES A TOTAL OF TWO LAYERS OF BI-PLY FIBERGLASS ADDED IN THIS AREA). TYPICAL, BOTH SIDES OF CONTAINER BASE.

NOTES:

1. ONE LAYER OF BI-PLY FIBERGLASS (CONSISTING OF: ONE LAYER OF 24 OZ. WOVEN AND ONE LAYER OF 1 1/2 OZ. FIBERGLASS MAT) ADDED TO SIDEWALL IN AREAS INDICATED. TYPICAL, BOTH SIDES OF CONTAINER.
2. ONE LAYER OF BI-PLY FIBERGLASS (CONSISTING OF: ONE LAYER OF 24 OZ. WOVEN AND ONE LAYER OF 1 1/2 OZ. FIBERGLASS MAT) ADDED TO ENDWALL OF CONTAINER BASE. TYPICAL, BOTH ENDS OF CONTAINER.
3. ALL FIBERGLASS WAS ADDED TO THE INSIDE SURFACE OF THE CONTAINER BASE.

FIGURE 3. ADDITIONAL GLASS MATTING, BASE.
15

DATE	BY	REVISION	INSIDE VIEW OF BASE	DATE	BY	REVISION
			MAINTENANCE CONTAINER			



FIGURE 4. ADDITIONAL SEALANT COMPOUND, TIEDOWN RING.

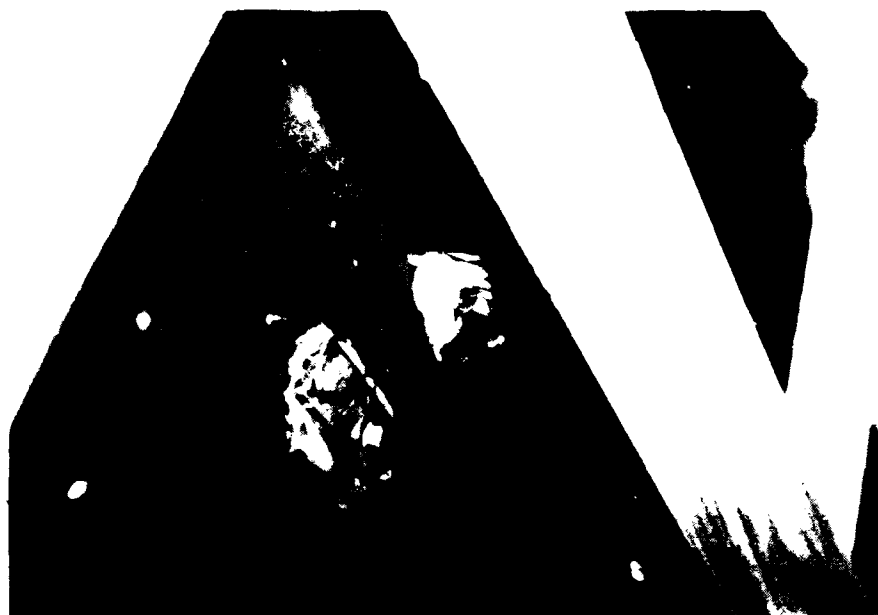


FIGURE 5. ADDITIONAL SEALANT COMPOUND, STRAP ATTACHMENT POINT.



FIGURE 6. CNU-425/E CONTAINER.



FIGURE 7. STACKED PENDULUM-IMPACT TEST, DAMAGE TO CONTAINER 0168.



FIGURE 8. STACKED PENDULUM-IMPACT TEST, DAMAGE TO CONTAINER 0176.

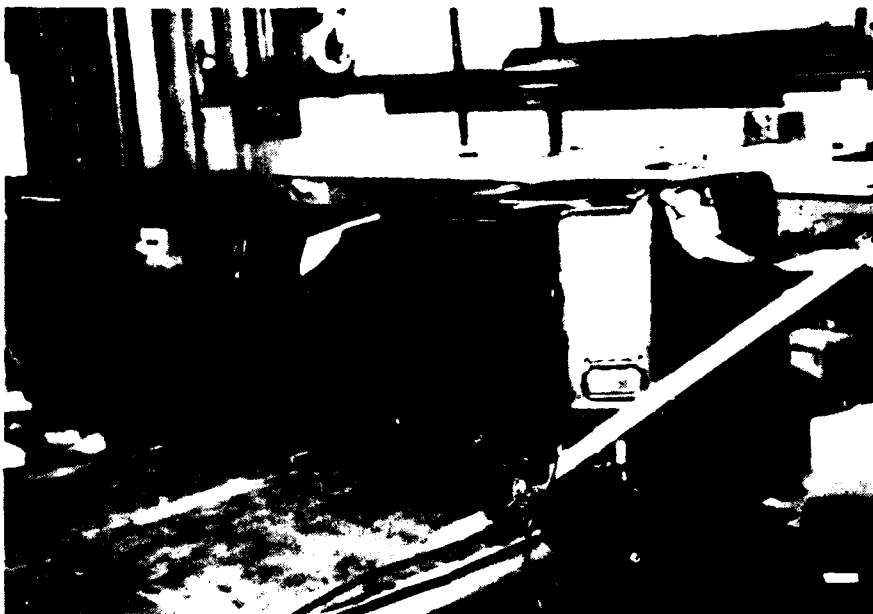


FIGURE 9. HIGH TEMPERATURE PENDULUM-IMPACT TEST, CONTAINER 0168.



FIGURE 10. FORKWELL POCKET, CONTAINER 0176.

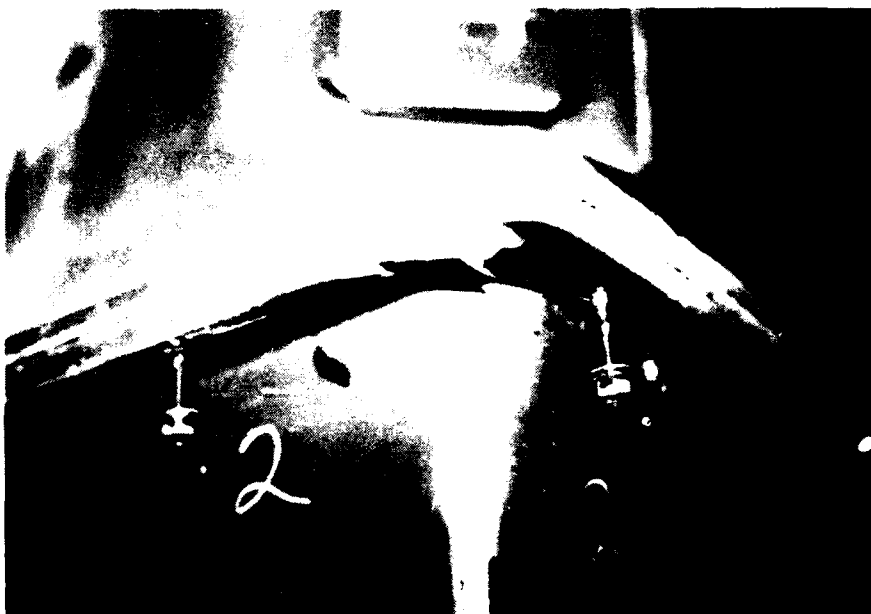


FIGURE 11. DAMAGE AT CORNER 1-2, CONTAINER 0168.



FIGURE 12. BROKEN STRAP, CONTAINER 0176.



FIGURE 13. ABRASION ON LOWER CRADLE, CONTAINER 0176.



FIGURE 14. CRADLE UNGLUED FROM CUSHION, CONTAINER 0176.



FIGURE 15. DELAMINATION ON COVER INTERIOR, CONTAINER 0176.



FIGURE 16. FORWARD CLAMP DAMAGE, CONTAINER 0168.



FIGURE 17. DEFORMATION OF RUBBER CUSHIONING, CONTAINER 0168.



FIGURE 18. AFT CLAMP MOVEMENT, CONTAINER 0168.

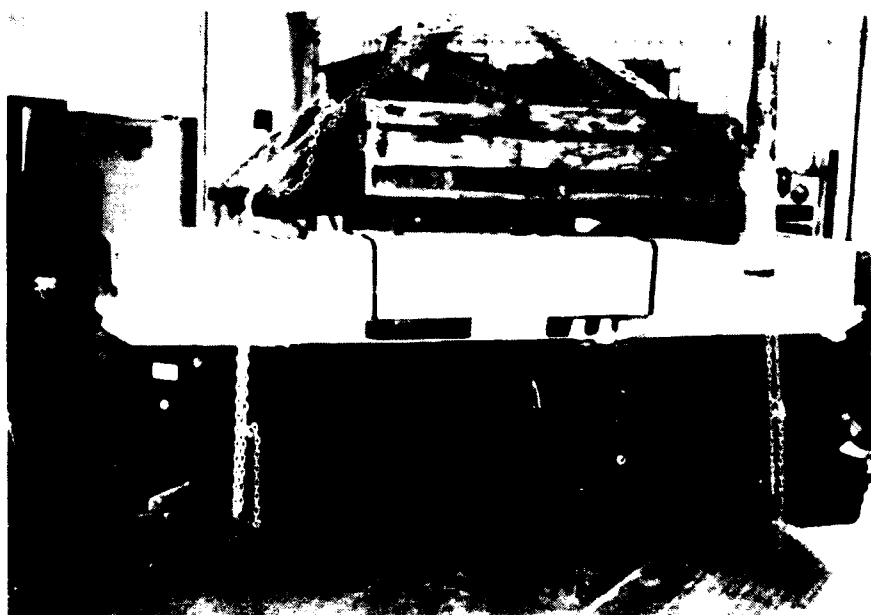


FIGURE 19. FOUR RING HOISTING TEST, CONTAINER 0176.



FIGURE 20. ONE RING HOISTING TEST, CONTAINER 0168.

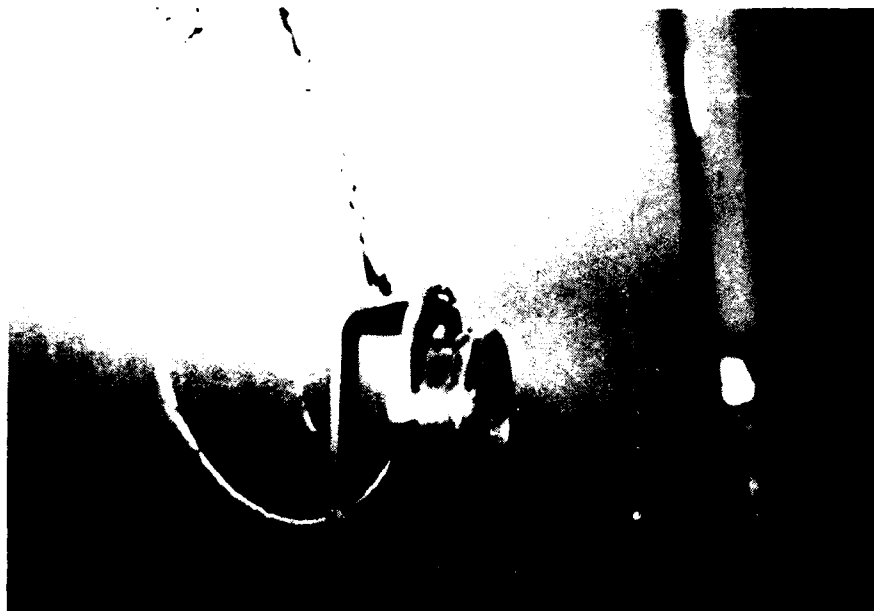


FIGURE 21. DAMAGE TO RECORD RECEPTACLE COVER, CONTAINER 0168.

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LEAK TEST (17 Nov 87)

Container	Serial No.	Initial Leak Test	Location of Leaks	Leak Test, After Torquing*	Location of Leaks
CNU-399	0001	Failed; ctr would not pressurize at all.	-between t-bolts 5 & 6, 7 & 8. -standoff between 8 & 9. -at t-bolts 5 - 9.	Failed; ctr would only pressurize to 0.596 psi.	-same as initial leak test.
CNU-399	0002	Failed; ctr would only pressurize to 0.596 psi w/ constant pressure.	-between t-bolts 7 & 8, 14 & 15, 15 & 16 (2 pl). -standoff between 8 & 9. -at t-bolts 6, 8 - 10. -crack in flange at t-bolt 7.	Failed; ctr pressurized to 1 psi, leakage rate ranged from 0.087 - 0.152 psi/hr.	-initial leaks were eliminated.
CNU-425	0003	Failed; ctr would only pressurize to 0.198 psi w/ constant pressure.	-between t-bolts 17 & 18 (deformation on cover flange).	Failed; ctr pressurized to 1 psi, but dropped immediately when pressure turned off.	-same as initial leak test.
CNU-425	0004	Failed; ctr pressurized to 1 psi, but leakage rate was 2.919 psi/hr.	-between t-bolts 5 & 6, 13 & 14. -at t-bolts 5 - 7, 18.	Failed; ctr pressurized to 1 psi, but dropped immediately when pressure turned off.	-same as initial leak test.

* Tightened t-bolts to 100-110 in-lbs.

DIMENSIONAL ANALYSIS
(18 Nov 87)

Drawing No.	Part	View	Drawing Dimension (Inches)	Actual Dimensions (Inches)
101312	Clamp, Fwd (inside length)	Front	$12.36 \pm .06$	12.13
101312	Clamp, Fwd (right, top angle)	Top	$17^{\circ} \pm 1^{\circ}$ *	36°
101313	Clamp, Aft (inside height)	Front	$9.75 \pm .06$	9.56
101313	Clamp, Aft (inside length)	Front	$12.44 \pm .06$	12.25
101313	Clamp, Aft (length, c to c)	Bottom	$14.88 \pm .03$	14.68
101313	Clamp, Aft	Bottom	$1.22 \pm .06$	1.31

* The angle is not dimensioned on drawing, value calculated using given dimensions.

AC INC CONTAINER TEST PLAN AND RESULTS

1. Initial leak test (1 hour Pressure & Vacuum):

- a. Container 101:
 - 1) Pressure: 2 Feb
 - a) First test: leaks at aft alignment pin side 4, leak rate $>.075$ psi/hr, FAILED.
 - b) Second test: leaks at T-bolt 2, leak rate $.010$ psi/hr, PASSED.
 - 2) Vacuum: 4 Feb, cover deflection $1-7/8$ " at aft end, leak rate $.020$ psi/hr, PASSED.
- b. Container 103:
 - 1) Pressure: 2 & 3 Feb
 - a) First test: would not hold pressure, leaks along flange.
 - b) Second test: leaks at fwd alignment pin side 4, and T-bolts 16 & 18, leak rate $>.076$ psi/hr, FAILED, cleaned sealing surface.
 - c) Third test: leak at T-bolt 18, leak rate $<.001$ psi/hr, PASSED.
 - 2) Vacuum: 4, 5 & 9 Feb, cover deflection 2" aft end
 - a) First test: leaks around T-bolt 18, leak rate $.056$ psi/hr, FAILED.
 - b) Second test: leaks around T-bolt 18, leak rate $.060$ psi/hr, FAILED.
 - c) Third test: leak rate $.103$ psi/hr, FAILED, replaced gasket.
 - d) Fourth test: leak rate $.110$ psi/hr, FAILED, sealing compound applied to forkwell bolts.
 - e) Fifth test: leak rate $.050$ psi/hr, PASSED.
- c. Container 104:
 - 1) Pressure: 2 Feb, leak rate $.002$ psi/hr, PASSED.
 - 2) Vacuum: 4 Feb, leak rate $.050$ psi/hr, PASSED.
- d. Container 106:
 - 1) Pressure: 3 Feb
 - a) First test: leaks at pressure relief valve opening, T-bolt 7, and between T-bolts 6 & 7, leak rate $>.060$ psi/hr, FAILED, sealing compound put around pressure relief valve opening.
 - b) Second test: leak rate $.056$ psi/hr, FAILED, tightened T-bolts.
 - c) Third test: leak rate $.01$ psi/hr, PASSED.
 - 2) Vacuum: 4 Feb, leak rate $.044$ psi/hr, PASSED.

2. Rough handling, ambient (stacked pendulum impact): 5 Feb

- a. Container 104 - bottom container:
 - 1) Side 3: did not remain stacked, damage to stacking interface, aft clamp hitting desiccant basket, FAILED.
 - 2) Side 1: remained stacked, abrasion.
 - 3) Side 2: remained stacked, chips from gel coat at T-bolt 3, 4, & 9.

Atch 2

AC INC CONTAINER TEST PLAN AND RESULTS (CONT'D)

- 4) Side 4: remained stacked, chips from gel coat at T-bolts 13 & 20.
- b. Container 106 - top container:
 - 1) Side 3: did not remain stacked, damage to bottom aft end of container, hole.
 - 2) Side 1: remained stacked, no apparent visual damage.
 - 3) Side 2: remained stacked, no apparent visual damage.
 - 4) Side 4: remained stacked, no apparent visual damage.
3. Leak test, 15 min Pressure: 5 & 8 Feb
 - a. Container 104:
 - 1) Leak rate .243 psi/15 min, **FAILED**, therefore the rough handling test, ambient, stacked pendulum impact test **FAILED**.
 - 2) Leaks found at bolts in forkwell area (below T-bolts 5, 8, 15 & 18), T-bolt 8, 9, 13 & between 14 & 15 and tiedown rings at T-bolts 9 & 14. Side 4 straps unstitched. (Straps were replaced on 9 Feb)
 - **Sealing compound was put around all attachment points of containers 101, 104 & 106. Container 103 had sealing compound previously applied on forkwell area bolts (see 1b2d).
 - b. Container 106:
 - 1) Would not hold pressure, hole found in bottom aft end of container.
4. Rough handling, +140°F (container 101): 11-12 Feb
 - 1) Corner 1-2, no apparent visual damage.
 - 2) Corner 3-4, no apparent visual damage.
 - 3) Edge 3, no apparent visual damage.
 - 4) Edge 2, no apparent visual damage.
 - 5) Side 1, no apparent visual damage.
 - 6) Side 2, no apparent visual damage.
 - 7) Side 3, no apparent visual damage.
 - 8) Side 4, no apparent visual damage.
5. Leak test on, 15 min Pressure (container 101): 12 Feb
 - a. Leak rate .116 psi/15 min, **FAILED**, therefore rough handling tests, +140°F **FAILED**.
 - b. Leaks found at bolts in forkwell area, flange area. Opened container, cushion loosened in fwd area (1/3), side 4 straps unstitched, back strap had bent u-bolt and a chunk of fiberglass detached from saddle. Side 2 straps loosened, fwd clamp had crack down middle and gouge on interior where missile shifted. Top of fins on

AC INC CONTAINER TEST PLAN AND RESULTS (CONT'D)

missile hit desiccant basket and caused damage. On cover (side 2), the fwd clamp hit and created stress cracks where it hit. Rubber strips on saddle loosening.

6. Free fall drop test, 18" (container 103): 10 Feb
 - a. No apparent visual damage.
7. Leak test, 15 min Pressure (container 103): 10 Feb
 - a. Leak rate .177 psi/15 min, FAILED therefore the free fall drop test, 18" FAILED.
 - b. Leaks found at flange area, T-bolt torque values were recorded and were not consistent (i.e. #18 32 in-lbs and #15 165 in-lbs).
8. Hoisting strength test (container 103): 9 Feb
 - a. No apparent visual damage and/or deformation.
9. Leak test, 15 min P (container 103): 10 Feb
 - a. Leak rate .005 psi/15 min, PASSED, therefore the hoisting strength test PASSED.
10. Free fall drop test, 4' (ctr 106): 10 Feb
 - a. The container held its contents, PASSED.